Fisheries and Oceans Canada | Pêches et Océans Canada
Ecosystems and Oceans Science | Sciences des écosystèmes et des océans

Maritimes Region

Canadian Science Advisory Secretariat
Science Response 2018/036

STOCK STATUS UPDATE OF BROWNS BANK NORTH SCALLOPS (*PLACOPECTEN MAGELLANICUS*) IN SCALLOP FISHING AREA 26

Context

Advice on the status of the Browns Bank North Scallop stock is requested annually by Fisheries and Oceans Canada (DFO) Resource Management to help determine a total allowable catch (TAC, meat weight) in support of the fishery. The purpose of this report is to update the status of Browns Bank North scallop with data from the 2017 Scallop survey and fishery to provide science advice for the management of the 2018 fishery. The last peer-reviewed Regional Advisory Process for this stock occurred in 2013 (DFO 2013, Hubley et al. 2013) and updates were conducted for years 2014-2017 (DFO 2014, 2015, 2016, 2017).

This update for the Scallop fishery on Browns Bank pertains to the northern part of the bank. Browns Bank South is a marginal growth area for scallops and has separate management measures. The assessment and advice presented in this document use the assessment framework established in 2011 (Hubley et al. 2011) for Browns Bank North.

This Science Response reports results from the Science Response Process of April 18, 2018, on the Stock Status Update of Offshore Scallop: Browns Bank North and Georges Bank 'a'.

Analysis and Response

The location of Browns Bank North and the other Offshore Scallop Fishing Areas (SFAs) is provided in Figure 1. The 2017 TAC was 750 tonnes (t) for Browns Bank North and total reported landings were 768 t (Figure 2). Based upon preliminary analysis of the 2017 fishery data and the annual stock survey data, an interim TAC of 400 t was set in December 2017 for the 2018 Browns Bank North fishery.

Science advice is provided for this stock using a Bayesian state-space modified delay difference assessment model that integrates both fishery and survey data and is described in Hubley et al. (2013). The model fit to the survey estimates of fully-recruited (≥ 95 mm shell height) biomass, recruit (85-94.9 mm) biomass, and fishery Catch Per Unit Effort (CPUE, kg/(hour-metre)) are shown in Figure 3. Estimates of fully-recruited biomass in 2017 and projections of fully-recruited biomass for 2018 under various catch scenarios are presented for this stock (Table 1 and Figure 4). Reference points have been proposed for the fishery (DFO 2012) but have not yet been adopted.

The modelled median fully-recruited biomass is estimated to be 2,836 t in 2017 (Figure 4). This is a decrease from the 2016 estimate (4,708), and it is below the long-term median biomass of 5,550 t (the long-term median calculations (1991-2016) exclude the current year (2017) estimates). The median recruit biomass, estimated to be 194 t in 2017, is below both the 2016 estimate (785 t) and the long-term median recruit biomass of 648 t.

The model's forecasted fully-recruited biomass for 2018 is 2,621 t; this forecast assumes:

- a catch of 400 t (the interim TAC),
- the condition of scallop in 2018 remains the unchanged from 2017 (11.3 g/dm^3), and
- natural mortality in 2018 will be unchanged from 2017 (0.14).

This represents an estimated 7.6% decrease in fully-recruited biomass from 2017 to 2018.

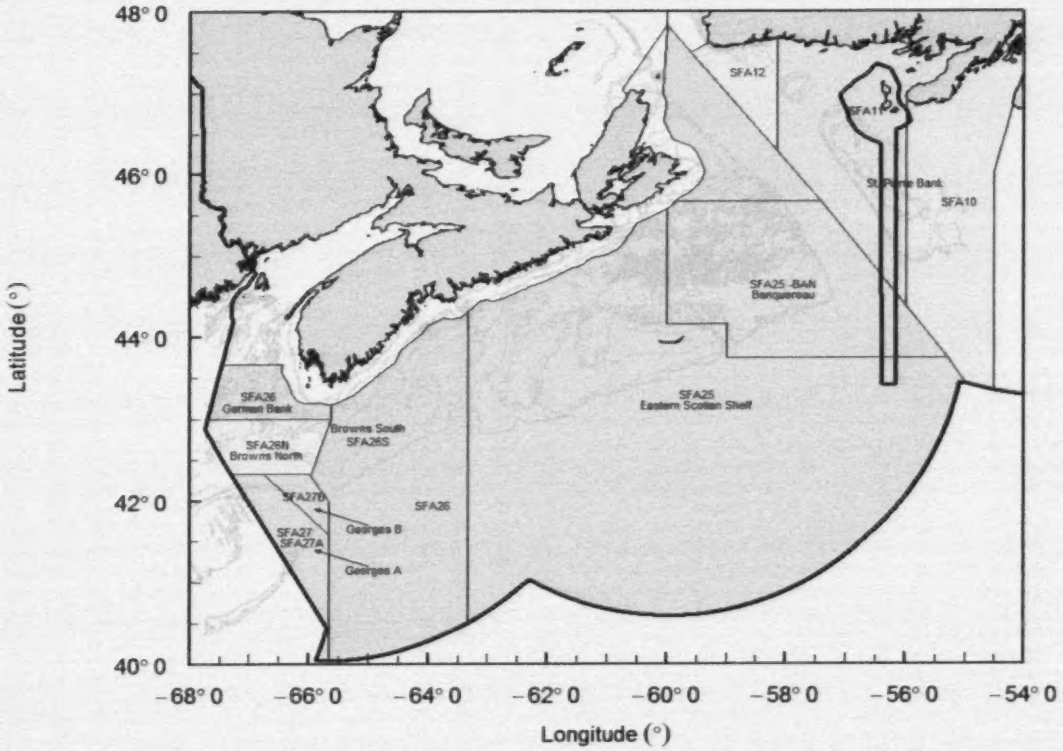

Figure 1. Map showing the Offshore Scallop Fishing Areas (SFAs) 25-27 used for management purposes in the Maritimes region. Note the division of Browns Bank North as a subarea of SFA 26.

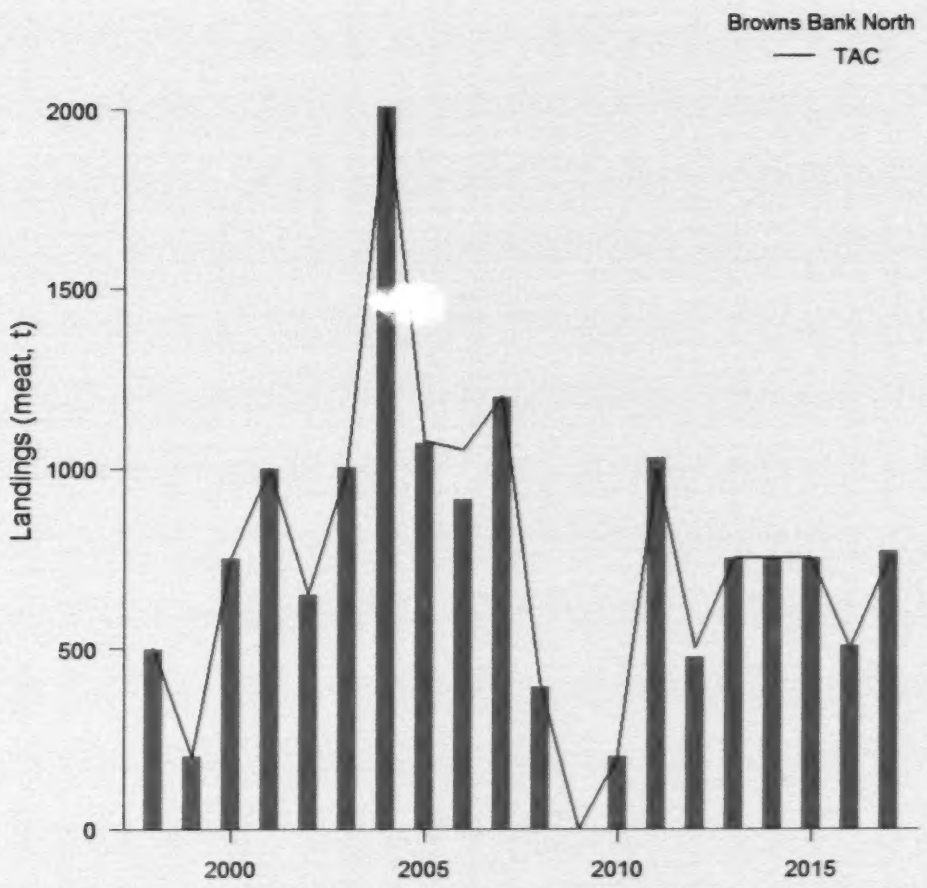

Figure 2. Landings of Scallop meats (tonnes) from Browns Bank North between 1998 and 2017. The blue line represents Total Allowable catch (TAC), in tonnes. Prior to 1998, landings from Browns Bank North were combined with Browns Bank South.

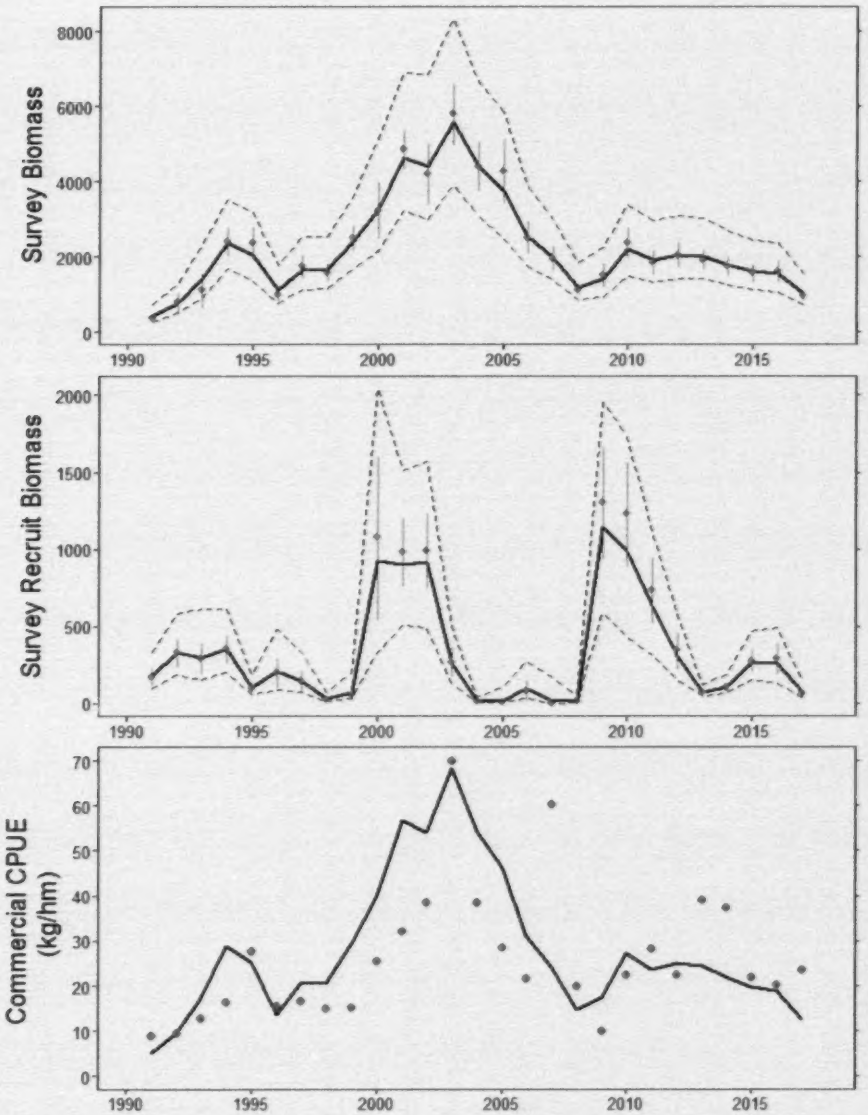

Figure 3. Summary of model results and inputs for fully-recruited (≥95 mm) survey biomass (top panel, in tonnes), recruit (85-94.9 mm) survey biomass (middle panel, in tonnes) and commercial Catch Per Unit Effort (CPUE) (bottom panel, in kg/hour-metre) $\frac{\text{kg}}{\text{hour} \times \text{meter}}$ *for Browns Bank North. The thick black line is the model estimate and the circles represent observed values from the survey and the fishery. For the survey data, the vertical lines represent the standard error associated with the observed values and the dashed lines represent the modelled 95% credible intervals.*

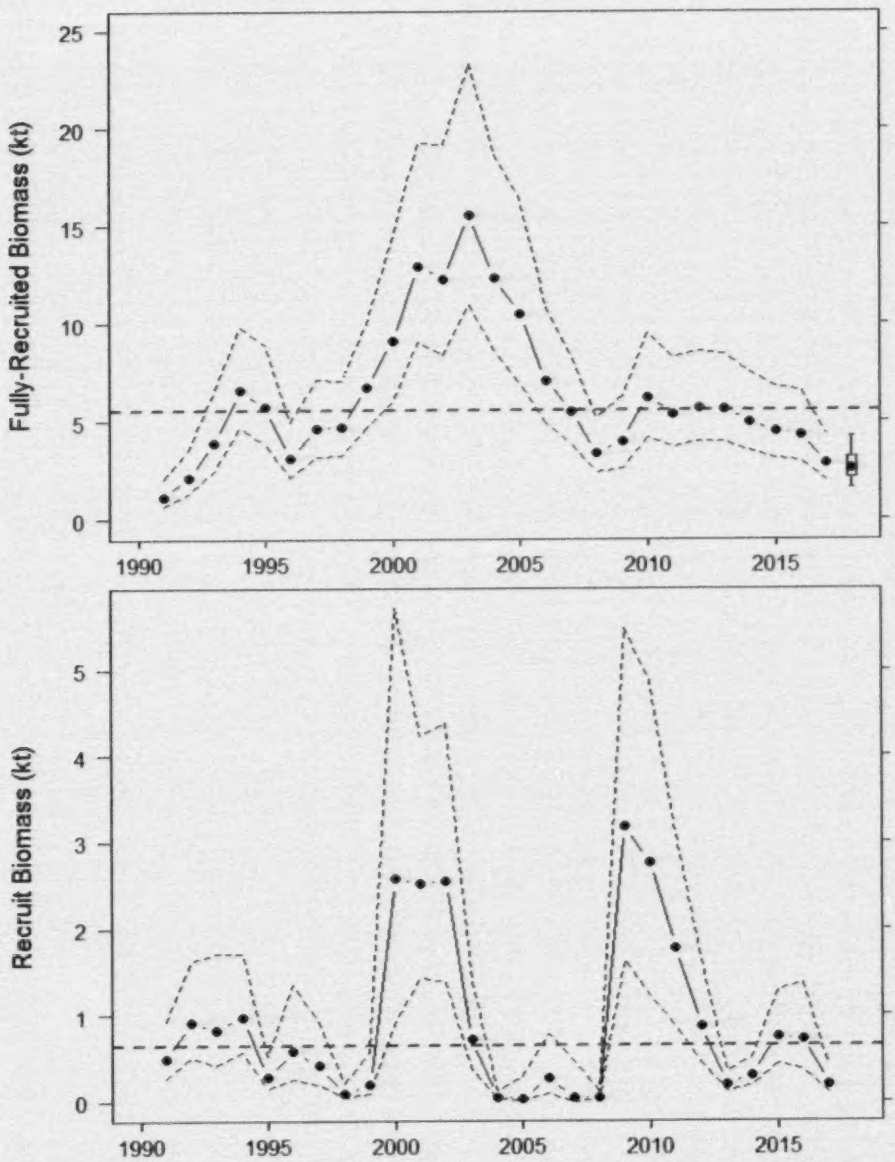

Figure 4. Biomass estimates (kilotonnes) for fully-recruited (≥95 mm) (top panel) and recruit (85-94.9 mm) (lower panel) scallops from the stock assessment model fit to the Browns Bank North survey and commercial data. Dashed lines are the upper and lower 95% credible limits. The blue horizontal dashed line represents the long-term median biomass. The forecasted fully-recruited biomass for 2018, assuming a catch of 400 t, is displayed as a box plot with median (•), 50% credible limits (box) and 80% credible limits (whiskers).

Table 1. Catch scenarios for Browns Bank North in 2018 in terms of exploitation and expected changes in fully-recruited biomass. Potential catches in 2018 are evaluated in terms of the probability of a decline in biomass. These probabilities account for uncertainty in the biomass forecasts.

Catch (t)	Exploitation Rate	Probability of Biomass Decline	Expected Change in Biomass (%)
150	0.11	0.56	-5
200	0.12	0.59	-7
250	0.14	0.61	-8
300	0.16	0.64	-10
350	0.17	0.66	-12
400	0.19	0.69	-14
450	0.21	0.71	-15
500	0.22	0.74	-18
550	0.24	0.76	-19
600	0.25	0.77	-21

Conclusions

The 2018 interim TAC of 400 t results in an exploitation rate of 0.19 and an expected 14% decrease in biomass (Table 1). Catch scenarios ranging from 150 t to 600 t were examined; all scenarios result in projected declines in fully-recruited biomass. The probability of biomass decline ranged from 0.56 (150 t) to 0.77 (600 t) while the change in biomass varied from -5% to -21% for the catch scenarios presented (Table 1).

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Sources of Information

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MPO. 2018. Mise à jour sur l'état du stock de pétoncles (Placopecten magellanicus) du nord du banc de Brown dans la zone de pêche du pétoncle 26. Secr. can. de consult. sci. du MPO, Rép. des Sci. 2018/036.